

Abstract

An improved system based on the Czochralski process for continuous growth of a single crystal ingot comprises a low aspect ratio, large diameter, and substantially flat crucible, including an optional weir surrounding the crystal. The low aspect ratio crucible substantially eliminates convection currents and reduces oxygen content in a finished single crystal silicon ingot. A separate level controlled silicon pre-melting chamber provides a continuous source of molten silicon to the growth crucible advantageously eliminating the need for vertical travel and a crucible raising system during the crystal pulling process. A plurality of heaters beneath the crucible establish corresponding thermal zones across the melt. Thermal output of the heaters is individually controlled for providing an optimal thermal distribution across the melt and at the crystal / melt interface for improved crystal growth. Multiple crystal pulling chambers are provided for continuous processing and high throughput.